

What is claimed is:

1. An optical element for gathering light emitted from a planar luminous element having isotropic light emitting characteristics, comprising:

5 an incidence plane formed on one side of the optical element for permitting the light to enter the optical element, the incidence plane facing the planar luminous element; and

a plurality of protrusions formed on the other side of the optical element, each protrusion having a shape of a frustum.

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2. The optical element according to claim 1, wherein each protrusion has a top plane and a basal plane, an area ratio of the top plane to the basal plane being ranged from 1% to 46% inclusive of 1% and 46%.

15 3. The optical element according to claim 2, wherein the area ratio is ranged from 20% to 30% inclusive of 20% and 30%.

4. The optical element according to claim 1, wherein each protrusion has a top plane, a basal plane and an oblique line, the top plane having a
20 circumference, the basal plane having a circumference and a center, the oblique line being the shortest line that links the circumference of the top plane and the circumference of the basal plane, an angle between the oblique line and a

straight line that passes through the center and that is perpendicular to the incidence plane being ranged from 7.5° to 27° inclusive of 7.5° and 27° .

5 5. The optical element according to claim 4, wherein the angle is ranged from 10° to 15° inclusive of 10° and 15° .

6. The optical element according to claim 1, wherein the frustum is a conical frustum.

10 7. The optical element according to claim 1, wherein the frustum is a multiangularly pyramidal frustum.

8. The optical element according to claim 7, wherein the pyramidal frustum is a regular pyramidal frustum.

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9. The optical element according to claim 8, wherein the regular pyramidal frustum has a basal plane, the number of sides of the basal plane being equal to or more than six.

20 10. The optical element according to claim 8, wherein the regular pyramidal frustum has a basal plane, the number of sides of the basal plane being equal to four.

11. The optical element according to claim 7, wherein the other side of the optical element is completely covered with the protrusions.

5 12. The optical element according to claim 11, wherein the number of kinds of the shape of the frustum is singular.

13. The optical element according to claim 11, wherein the number of kinds of the shape of the frustum is plural.

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14. A planar lighting unit comprising:

a planar luminous element having an exit plane from which light isotropically exits;

an optical element placed on the exit plane for gathering the light, the

15 optical element including;

an incidence plane formed on one side of the optional element for permitting the light to enter the optical element, the incidence plane facing the planar luminous element; and

20 a plurality of protrusions formed on the other side of the optical element, each protrusion having a shape of a frustum.

15. The planar lighting unit according to claim 14, wherein the frustum is a

conical frustum.

16. The planar lighting unit according to claim 14, wherein the frustum is a multiangularly pyramidal frustum.

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17. The planar lighting unit according to claim 16, wherein the pyramidal frustum is a regular pyramidal frustum.

18. A planar luminous unit comprising:

10 a planar luminous element having an exit plane from which light isotropically exits;

an optical element placed on the exit plane for gathering the light, the optical element including;

15 an incidence plane formed on one side of the optional element for permitting the light to enter the optical element, the incidence plane facing the planar luminous element; and

a plurality of protrusions formed on the other side of the optical element, each protrusion having a shape of a frustum.

20 19. The planar luminous unit according to claim 18, wherein the frustum is a conical frustum.

20. The planar luminous unit according to claim 18, wherein the frustum is a multiangularly pyramidal frustum.

21. The planar luminous unit according to claim 20, wherein the pyramidal
5 frustum is a regular pyramidal frustum.

22. The planar luminous unit according to claim 18, wherein the planar luminous element is an organic electroluminescent element.

10 23. The planer luminous unit according to claim 22, wherein the organic electroluminescent element is a bottom emission type.

24. A liquid crystal display unit comprising:

a backlight including;

15 a planar luminous element having an exit plane from which light isotropically exits;

an optical element placed on the exit plane for gathering the light,
the optical element including;

an incidence plane formed on one side of the optional
20 element for permitting the light to enter the optical element,

the incidence plane facing the planar luminous element;

a plurality of protrusions formed on the other side of the

optical element, each protrusion having a shape of a frustum;

and

a liquid crystal panel, through which the light reaches a user's eyes,
placed near the protrusions.

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25. The liquid crystal display unit according to claim 24, wherein the frustum
is a conical frustum.

26. The liquid crystal display unit according to claim 24, wherein the frustum
10 is a multiangularly pyramidal frustum.

27. The liquid crystal display unit according to claim 26, wherein the
pyramidal frustum is a regular pyramidal frustum.